



(51) International Patent Classification:
H04B 10/00 (2013.01) *G02B 6/04* (2006.01)

(21) International Application Number:
PCT/US2021/052647

(22) International Filing Date:
29 September 2021 (29.09.2021)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
17/062,169 02 October 2020 (02.10.2020) US

(71) Applicant: **X DEVELOPMENT LLC** [US/US]; 1600 Amphitheatre Parkway, Mountain View, CA 94043 (US).

(72) Inventors: **BRINKLEY, Devin**; 1600 Amphitheatre Parkway, Mountain View, CA 94043 (US). **CSONKA, Paul**; 1600 Amphitheatre Parkway, Mountain View, CA 94043 (US). **MOZAFFARI, Sanam**; 1600 Amphitheatre Parkway, Mountain View, CA 94043 (US). **ERKMEN, Baris, Ibrahim**; 1600 Amphitheatre Parkway, Mountain View, CA 94043 (US).

(74) Agent: **LIN, Jennifer, Y.** et al.; Botos Churchill IP Law LLP, 430 Mountain Ave., Suite 401, New Providence, NJ 07974 (US).

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

(54) Title: DETERMINING POINTING ACCURACY USING OPTICAL FIBER BUNDLE

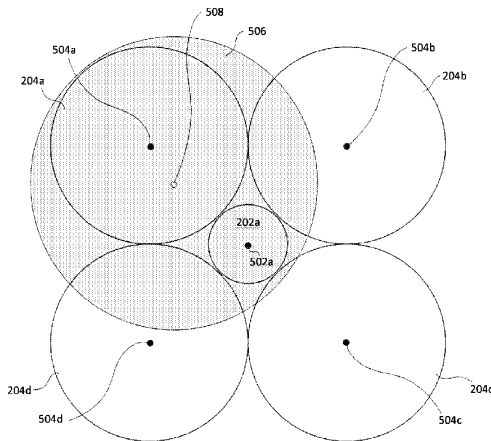


FIGURE 5

(57) Abstract: A free-space optical communication device 102 includes an optical fiber bundle 118 and one or more processors 104. The optical fiber bundle 118 includes a central fiber 202 connected to a first photodetector, and a plurality of surrounding fibers 204, each surrounding fiber connected to a corresponding second photodetector. The one or more processors 104 are in communication with the first photodetector and each second photodetector. The one or more processors 104 are also configured to receive a current or voltage generated at the first photodetector and each second photodetector and to determine a pointing accuracy of a beam received at the optical fiber bundle 118 based on the current or voltage generated at the second photodetectors.

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

- *with international search report (Art. 21(3))*